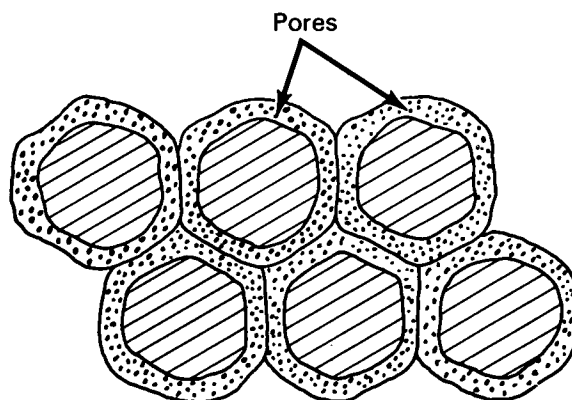
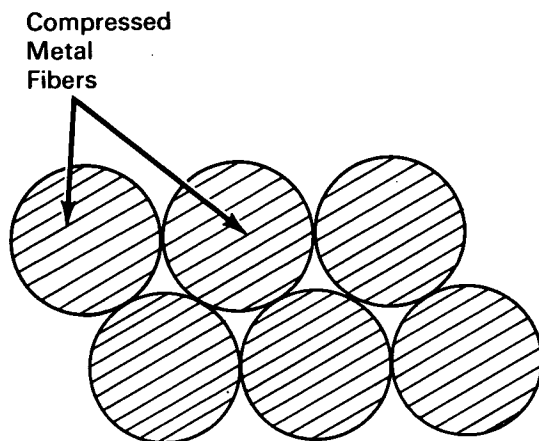


# NASA TECH BRIEF



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## Process Reduces Pore Diameters to Produce Superior Filters



### The problem:

Porous metal structures with extremely small pore diameters cannot be produced by standard powder or fiber metallurgy techniques. When compressed metallic powder particles of four microns or less are sintered, densification is rapid due to the high surface energy of the particles and complete pore closure results.

### The solution:

A porous metal structure that is heated in oxygen to form an oxidized layer on its surface, cooled, and then heated in hydrogen to deoxidize the oxidized portion. This forms a structure with greatly increased surface area having much finer pores.

### How it's done:

A metal structure as shown at left above is heated in oxygen at 850°F for a time interval determined

by the desired final pore size. Each fiber or metal particle is thereby coated with an oxide layer that is at a lower density but greater volume than the parent metal. After the oxidation process is carried to the proper depth, the material is cooled and then reheated in a reducing atmosphere of hydrogen at about 1800°F until no further weight loss occurs, indicating complete reduction of the previously developed oxide. The porous metal structure as shown at right above has now acquired a great increase in volume and a consequent great reduction in pore size.

### Notes:

1. This process could be used to produce filters for extremely fine fluid applications.
2. Porous structures formed by this method could be impregnated with platinum salts, etc. and chemically reduced to form effective catalyst beds.

(continued overleaf)

**Patent status:**

Title to this invention has been waived under the provisions of the National Aeronautics and Space Act (42 U.S.C. 2457 (f)) to Electro-Optical Systems, Inc., 300 North Halstead Street, Pasadena, California, 91107.

Source: Hoyt H. Todd of  
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